

ATTACHMENT I

- I-1 Formation Testing Program
- I-2 Fracture Gradient Testing and Analysis, RAS Integrated Subsurface Evaluation
- I-3 Laboratory Reports
- I-4 Memorandum Regarding Petroleum Compounds in Groundwater, Haley & Aldrich

ATTACHMENT I-1
FORMATION TESTING PROGRAM

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1. INTRODUCTION

This Attachment was prepared in support of Excelsior Mining Arizona, Inc.'s (Excelsior's) Underground Injection Control (UIC) Permit application to the United States Environmental Protection Agency (USEPA). Excelsior is applying for an area Class III UIC permit to install a wellfield for in-situ recovery (ISR) of copper at the Gunnison Copper Project (Project), located in Cochise County, Arizona.

This attachment documents formation characteristics at the Project, specifically:

- Fluid pressure
- Fracture pressure
- Chemical characteristics of the formation fluids (i.e. groundwater)

Other aquifer characteristics including hydraulic conductivity, transmissivity, storativity, and porosity are discussed in Attachment N.

2. FLUID PRESSURE

Lixiviant will be delivered to the oxide zone in the bedrock, specifically the Martin, Abrigo formations, and to a lesser extent, the Escabrosa formation and the Texas Canyon quartz monzonite. Within the wellfield, bedrock is covered by 300 to 800 feet of alluvium which is mostly unsaturated (Figure F-3).

Groundwater levels are discussed in Section 2.5.4 of Attachment A-2, and a complete groundwater level database used for the groundwater flow model is provided in Exhibit 1 in Attachment A-2

A depth-to-groundwater map, based on a water level sweep conducted in June 2015, is presented on Figure I-1. Depths to water ranged from 244 feet below land surface at exploration drill hole NSD-030 in the northwest part of the Project, to 655 feet below land surface at hydrology study well NSH-013 near the middle of the orebody.

Figure I-2 shows the relationship of the potentiometric surface to the bedrock surface. Positive numbers indicate that the potentiometric is deeper than the bedrock-basin fill contact. Negative numbers indicate the potentiometric surface is above the basin fill-alluvium contact. However, most negative numbers are indicative of confined conditions, not saturated alluvium (which is discussed below).

3. FRACTURE PRESSURE

Figure I-2-1 shows the locations of the wells that were tested for fracture gradient pressures. Fracture gradient testing conducted in 2015 (29 packer tests in six formations) resulted in fracture gradients ranging from 0.78 to 2.22 pounds per square inch per foot (psi/ft).

Test results included:

- The site-wide average pressure gradient was 1.67 psi/ft and 1.55 psi/ft using the Peak and slope intercept methods, respectively.
- The minimum pressure gradient was 0.78 psi/ft and the maximum pressure gradient measured was 2.22 psi/ft.
- The Escabrosa formation appeared to be the weakest of the rocks at the Project site.

Excelsior proposes a conservative maximum injection pressure gradient of 0.75 psi/ft to prevent hydraulic fracturing and propagation of existing fractures, to be measured daily. The maximum allowable injection pressure will be calculated as follows:

- The difference in the elevation of the pressure gauge in the header pipe/ manifold at the surface and the bottom of the casing will be calculated. In general, this will be 600 to 650 feet.
- The head of the solution will be calculated based on this elevation difference.
- Then the fracture gradient pressure will be calculated based on the elevation difference between the surface elevation at the wellhead and the bottom of the surface FRP casing. Frictional losses will be calculated. The maximum allowable pressure is then the difference of the fracture gradient pressure and the head of the solution plus frictional losses and this is the pressure to not be exceeded at the pressure gauge on the header or manifold.

If the pressure gauge is located in the header to an individual well, then the surface elevation and bottom of casing depth will be used for this well. If the pressure gauge is located in the main manifold, then a conservative approach will be taken by using the lowest calculated fracture gradient pressure of a particular well within the group of wells connected to the manifold with be used in the calculation as follows:

E_H = elevation at header in feet

E_{BC} = elevation at bottom of casing in feet

E_S = elevation at the surface of a well in feet

FG = allowable fracture gradient = 0.75 psi/ foot

H_{MS} = mining solution psi per foot = 0.47 psi/foot (estimate at this point to be recalculated based on observed density of raffinate/PLS)

FL = frictional losses in psi to be calculated

$(E_S - E_{BC}) * FG - (E_H - E_{BC}) * H_{MS} + FL$ = pressure limit at the header or manifold in psi

The complete RAS report documenting the fracture gradient testing is provided in Attachment I-2.

4. CHEMICAL CHARACTERISTICS OF FORMATION FLUIDS

Excelsior collected water samples from 27 wells to characterize groundwater quality in and near the oxide orebody, where ISR will take place. Well locations are presented on Figure I-3.

Three wells were sampled in 2012; the remaining wells were sampled in 2015. Well NSH-006 was sampled in both years. Samples were analyzed for major and minor cations and anions (25 wells), trace metals (24 wells), radionuclides (20 wells), and volatile organic compounds (VOCs) (25 wells). The results are presented on Tables I-1 through I-4. Laboratory analyses reports are included in Attachment I-3.

The NSH boreholes were drilled to further characterize the geology of the Project, and the well completion intervals were designed to characterize the water quality of a variety of formations:

- Sixteen wells were completed within the proposed ISR wellfield (oxide zone Martin and Abrigo formations).
- Two wells were completed in the basin fill (NSH-006 and NSH-011).
- Two wells were completed in the Texas Canyon quartz monzonite overlying the oxide zone (NSH-015 and NSH-016).
- Two wells were completed in the bedrock (oxide zone) to the east of the proposed ISR mine (NSH-018 and NSH-020).
- Two wells were completed in the sulfide zone underlying the proposed ISR wellfield (NSH-14B and NSH-25). The groundwater quality of the sulfide-zone wells was expected to differ from the water quality in the oxide and unmineralized areas due to the presence of sulfide minerals, and this was the case. The results from the sulfide-zone wells were not included in the statistical analyses presented here, but are included in the tables for reference.

The sampling program focused on the NSH wells, which were installed to characterize the geology, hydrogeology, and groundwater quality of the Project. However, water quality samples were also collected from coreholes CS-10, CS-14, and NSM-003 for analysis of organic constituents. In the course of monitoring, Excelsior detected petroleum odors in these and other coreholes, and free product in CS-10 and CS-14. Samples were collected as part of a study of Light Non-Aqueous Phase Liquids (LNAPLs) in groundwater by Haley & Aldrich (2015) included as Attachment I-4. The LNAPL study and the organic compounds in the NSH- series wells are further discussed in Attachment I-3.

4.1 Major and Minor Cations and Anions

Major and minor cation and anion chemistry for samples collected from the NSH wells are presented on Table I-1.

Based on the sampling data for the NSH wells (excluding the aforementioned wells completed in the sulfide zone), groundwater at the Project is generally a calcium-sodium-magnesium-bicarbonate type with total dissolved solids (TDS) concentrations in the range of 210 to 420 milligrams per liter (mg/L). A Piper diagram for the NSH wells is presented in Figure I-4 and a map with TDS concentrations is presented in Figure I-5. Average sulfate, nitrate, and fluoride concentrations were 19.8 mg/L, 1.6 mg/L, and 3.0 mg/L, respectively. Four of the samples contained fluoride at concentrations higher than the Aquifer Water Quality Standard (AWQS) and Federal Maximum Contaminant Level (MCL) of 4 mg/L. In the following discussion, the MCL is indicated only when it differs from the AWQS.

The groundwater samples from the two wells screened in the sulfide zone (NSH-14B and NSH-25) are sodium-carbonate-bicarbonate and sodium-bicarbonate-chloride-sulfate types with TDS values approximately 600 to 700 mg/L. These two samples have elevated alkalinities, sodium, and sulfate concentrations compared to the samples from non-sulfide zone wells. The fluoride value from NSH-014B exceeds the 4 mg/L AWQS.

4.2 APP-Regulated Metals

Table I-2 summarizes sample results for dissolved metals for which numeric AWQSs have been established. Full laboratory analytical reports for all the samples are provided in Attachment I-3.

Overall, concentrations of Aquifer Protection Permit (APP)-regulated metals were low. None of the samples contained mercury or antimony at concentrations above reporting limits. The other APP-regulated metals were detected at concentrations higher than reporting limits in one or more non-sulfide-zone samples. All detections of APP-regulated metals in samples from the non-sulfide-zone wells were less than their respective numeric AWQSs.

Beryllium was detected at a concentration greater than its numeric AWQS in the sulfide-zone sample from well NSH-014B. No other APP-regulated metal AWQSs were exceeded in the two sulfide-zone samples.

4.3 APP-Regulated Radionuclides

Sample results for radiological analytes for which numeric AWQSs/MCLs have been established are presented on Table I-3. All the non-sulfide-zone samples met the AWQSs/MCLs for radionuclides.

The sulfide-zone sample from NSH-014B contained radium-226 and radium-228 at a combined activity of 11.6 picocuries per liter (pCi/l), exceeding the AWQS of 5 pCi/l. In this same sample, the unadjusted gross alpha activity was 275 pCi/l, and the adjusted gross alpha activity was 255 pCi/l, which is significantly higher than the AWQS of 15 pCi/l. According to ALS Environmental's "Condition of Sample Upon Receipt" Form contained in the analytical report,

the one-liter sample bottles from well NSH-014B each contained approximately two inches of sediment and the samples were shaken prior to being analyzed. Therefore, these were not strictly aqueous samples. The inclusion of sediment in the samples likely resulted in higher counts than would be expected from an aqueous sample¹ and therefore the results may not be representative of the groundwater in the sulfide zone below the Project.

4.4 Volatile Organic Compounds and Polycyclic Aromatic Hydrocarbons

4.4.1 Volatile Organic Compounds

A summary of VOC detections is provided on Table I-4; the full laboratory analytical reports are provided in Attachment I-3. Two samples were collected from NSH-007 and NSH-022; the other wells were sampled once.

Most VOCs in the NSH wells were reported as non-detect (Table I-4). Toluene was detected in 17 of 24 samples, with five detections at levels at least 33% of the 1,000 microgram per liter (µg/L) AWQS. All other toluene detections were less than 50 µg/L. The laboratory reported that toluene was measured at 1,940 µg/L in the April 2, 2015 NSH-022 sample², exceeding the AWQS. The reported concentration in the follow-up NSH-022 sample collected on May 5, 2015 was also above the AWQS (1,130 µg/L)³. No other BTEX (benzene, toluene, ethylbenzene, and xylenes) compounds were detected in either the original or follow-up VOC samples from NSH-022.

Samples from NSH-015, NSH-016, and NSH-017 had detections of 1,2-dichloroethane (1,2-DCA) and benzene. All detections of 1,2-DCA and benzene were less than their respective AWQSs.

Acetone was detected in three samples. The source of the acetone is unknown at this time. Acetone is often a laboratory-introduced contaminant (for reference see the elevated concentrations of acetone in the Trip Blanks for samples NSH-007 from May 6, 2015, and NSH-011 from April 30, 2015 in Appendix D). The acetone levels of 187 and 2,250 µg/L in the April 2, 2015 NSH-022 and the April 30, 2015 NSH-011 samples, respectively, are higher than noted in various Trip Blank samples, and are unexplained at this time.

Water quality samples collected from coreholes CS-10 and CS-14 for the Light Non-Aqueous Phase Liquids (LNAPL) study conducted at the Project (Attachment I-4) had detections of BTEX compounds and a few other VOCs. Only benzene was detected at concentrations higher

¹ August 17, 2015. Personal communication with Jeff Kujawa, ALS Environmental – Fort Collins, Colorado.

² The VOCs in the April 2, 2015 NSH-022 sample were analyzed by USEPA method 524.2. The toluene (and other VOC) results were confirmed by reanalyzing the sample using USEPA method 8260B (sample analyzed past the holding time).

³ The VOCs in the May 4, 2015 NSH-022 sample were analyzed by USEPA method 524.3 and confirmed with USEPA method 8260B. The results from USEPA method 524.3 are presented here.

than the AWQS of 5 µg/L. Non-aqueous phase liquid (free product) was recovered from these coreholes prior to sampling.

Tert-butyl alcohol (TBA), a degradation product of methyl tertiary butyl ether, was detected in the LNAPL study sample from well corehole NSM-003. There is currently no standard for TBA.

4.4.2 Polycyclic Aromatic Hydrocarbons

A summary of PAH detections is provided on Table I-4; the full laboratory analytical reports are provided in Attachment I-3. Two samples were collected from NSH-007 and NSH-022; the other wells were sampled once.

Three samples from the NSH wells had detections of PAHs; all three of those samples also had detections of toluene and two had detections of 1,2-DCA and benzene.

Several PAHs were detected in the LNAPL samples from coreholes CS-10 and CS-14 where free product had been recovered. Each sample had concentrations of naphthalene, 1-methylnaphthene and 2-methylnaphthalene greater than 300 µg/L. No AWQSs have been developed for the PAHs detected in samples from CS-10 and CS-14. PAHs were not detected in the sample from corehole NSM-003.

4.4.3 Excelsior Investigation of Organic Contaminants in Groundwater

During the course of monitoring in December 2014, Excelsior noted a petroleum odor emanating from and petroleum residue on monitoring equipment used in boreholes CS-09, CS-10, CS-14, DC-09, and NSM-003. In response, an investigation was conducted by Haley & Aldrich (Attachment I-4). LNAPL (also referred to as “free product”) was detected in boreholes CS-10 and CS-14 on February 5, 2015, and subsequently removed on February 11, 2015. Excelsior continued to periodically monitor for the presence and extent of free product at these sites, and on February 26, 2015, the free product thickness was approximately 0.25 feet in CS-10 and not detected in CS-14 (Haley & Aldrich, 2014).

Following removal of the free product from CS-10 and CS-14, Excelsior collected non-purged, investigative samples from CS-10, CS-14, and NSM-003. No sample was collected from DC-09 because it had been purged using air lifting (volatilizing the VOCs). No sample was collected from CS-09 because the bailer became fouled with the greasy substance in the borehole (Haley & Aldrich, 2014).

A map of wells and coreholes with elevated concentrations of petroleum hydrocarbons is presented in Figure I-6. This map includes the wells and coreholes from the LNAPL study and the NSH-series wells.

In their report (Attachment I-4), Haley & Aldrich concluded that the elevated concentrations of VOCs and PAHs in the samples were likely due to a gasoline and/or other petroleum product release. Presently, the source(s) of gasoline and/or other petroleum products is unknown. Haley & Aldrich identified two potential sources:

- 1) The Thing Dairy Queen Travel Center (The Thing; Facility ID 0-000748 | Leaking Underground Storage Tank (LUST) ID 4387), and
- 2) The Johnson Camp Mine (JCM) site⁴.

Three Underground Storage Tanks (USTs) were permanently removed from the Thing site on March 27, 1996. BTEX was detected in the soil beneath the USTs. The Arizona Department of Environmental Quality (ADEQ) UST Program opened three LUST case files in response to soil contamination and requested site characterization. The Thing LUST files were closed on May 23, 2005. ADEQ's primary rationales for closing the LUST case files were the lack of groundwater beneath the site and the fact that bedrock was encountered at a depth of less than two feet below the USTs (Attachment I-4).

A Phase I Environmental Site Assessment of the JCM site that was referenced in Haley and Aldrich's report did not reveal widespread use of gasoline at the site and noted that most mobile equipment, powered haulage, and beneficiation processes were not using gasoline (Attachment I-4). Based on the potentiometric surface map (Figure I-7), the JCM facilities are not strictly upgradient of the Project.

4.5 Groundwater Quality in the Vicinity of the Project

Clear Creek performed a search for water quality data within a two-mile radius of the Project using the National Water Quality Monitoring Council's Water Quality Portal (WQP) searchable database (<http://www.waterqualitydata.us/>). The WQP database is a cooperative service sponsored by the USGS, the USEPA, and the National Water Quality Monitoring Council. It serves data collected by over 400 state, federal, tribal, and local agencies. No groundwater quality data were located within the search area.

The Johnson Camp Mine (JCM) is located approximately one mile northwest of the Project. Based on the potentiometric surface elevation map (Figure I-7), the Project location is not downgradient of the JCM site, i.e. the groundwater direction from the JCM site generally flows to the east and the Project site lies to the southeast. The JCM Phase I Site Environmental Assessment contained groundwater quality data for two JCM Point of Compliance (POC) wells (Hill and Saddle wells). Several AWQs were exceeded for each JCM POC well, and the sulfate concentrations were elevated to above gypsum solubility, suggesting the water quality of the JCM POC wells is not representative of the regional groundwater quality. Therefore the JCM POC well water quality data were not included in this UIC application.

⁴ JCM is not strictly upgradient of the Project site. See Figure I-7.

TABLE I-1
Major Cation and Anion Chemistry in Groundwater

Well ID	Sample Date	Effective Screen Interval ^b	Geologic Unit	Alkalinity, Total (as CaCO ₃)	Calcium, Dissolved	Chloride	Fluoride	Magnesium, Dissolved	Nitrate (as N)	Potassium, Dissolved	Sodium, Dissolved	Sulfate	Total Dissolved Solids (TDS)
		(ft bls)		(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Aquifer Water Quality Standard				NS	NS	NS	4	NS	10	NS	NS	NS	NS
EPA National Primary Drinking Water Regulations Maximum Contaminant Levels				NS	NS	NS	4	NS	10	NS	NS	NS	NS
NSH-004B	12/04/2012	705-1009	Martin/Upper Abrigo	150	30.0	25.0	3.90	15.0	1.10	<5	20.0	14.0	250
NSH-005	11/19/2012	724-1040	Martin/Upper Abrigo	200	53.0	17.0	2.00	12.0	1.80	<5	27.0	32.0	310
NSH-006	12/12/2012	640-680	Alluvium	170	40.0	26.0	2.90	12.0	1.50	<5	29.0	14.0	280
NSH-006	05/13/2015			180	49.5	26.2	2.53	12.1	1.84	1.27	28.0	24.4	284
NSH-007	02/26/2015	484-620	Abrigo	188	48.9	23.1	2.14	17.0	2.26	1.99	23.3	14.7	315
NSH-007 Dup	02/26/2015			189	48.9	23.1	2.11	16.9	2.26	1.98	23.7	14.7	240
NSH-008	01/18/2015	711-840	Middle/Lower Abrigo	190	42.9	15.1	3.00	16.4	1.10	1.53	18.6	11.1	245
NSH-009	03/12/2015	813-995	Middle Abrigo	183	52.4	16.4	2.81	18.7	1.98	2.02	26.7	59.7	315
NSH-010	04/21/2015	546-720	Escabrosa, Martin	173	26.5	16.4	4.26	15.8	0.411	2.35	48.9	32.1	324
NSH-011	04/30/2015	500-540	Alluvium	174	45.0	16.7	0.955	11.0	0.715	1.66	18.6	15.1	238
NSH-013	05/04/2015	650-1070	Martin (Escabrosa, Texas Canyon)	146	28.2	21.8	4.38	21.0	1.00	2.26	19.1	10.4	237
NSH-014B ^a	04/23/2015	1180-1260	Lower Abrigo Sulfide	596	7.00	35.5	4.71	1.49	<0.500	4.05	190	82.4	2320 ^d
NSH-015	03/26/2015	585-820	Texas Canyon Quartz Monzonite	207	63.1	58.5	2.49	9.61	3.75	2.04	52.4	14.1	372
NSH-016	05/14/2015	580-820	Texas Canyon Quartz Monzonite	213	61.5	76.4	2.71	9.18	3.88	2.16	66.8	15.4	418
NSH-017	04/09/2015	940-1181	Middle/Lower Abrigo	203	49.7	34.6	2.65	13.2	2.04	1.69	38.4	15	317
NSH-018	04/16/2015	610-992	Black Prince	176	49.6	19.8	1.84	9.62	2.07	1.26	25.9	17.4	262
NSH-019	03/16/2015	638-1300	Martin/Abrigo	179	46.6	27.4	3.14	16.2	1.37	1.83	24.4	14.6	275
NSH-020	03/25/2015	1060-1582 ^c	Black Prince/Escabrosa/Martin	172	46.4	17.6	1.71	10.3	1.82	1.42	25.6	16.9	280
NSH-021C	05/19/2015	624-1372	Martin/Abrigo	179	47.5	28.0	2.81	16.1	1.52	1.89	26.6	15.3	280
NSH-022	04/02/2015	1110-1131	Abrigo	108	9.53	29.0	4.26	3.8	<0.05	2.91	66.2	40.5	210
NSH-023	03/03/2015	645-1442	Martin/Abrigo	146	33.2	17.9	3.89	16.5	0.507	2.20	24.4	20.9	249
NSH-024	05/27/2015	625-1440	Martin/Abrigo	149	35.0	27.1	3.62	18.3	1.1	2.05	23.7	14.8	263
NSH-025 ^a	05/05/2015	1469-1551	Lower Abrigo Sulfide	256	12.2	116	3.27	3.81	<0.05	67.7	167	148	622
NSH-026	04/20/2015	626-900	Escabrosa/Upper Abrigo	149	37.7	26.3	3.75	9.1	1.23	1.87	34.9	18.9	250
NSH-026 Dup	04/20/2015			150	39.4	26.2	3.75	9.4	1.22	1.97	36.0	18.9	254
NSH-027	02/12/2015	850-1022	Upper Abrigo	154	28.5	25.2	3.8	14.4	1.20	2.03	20.2	15.7	284
NSH-028	05/07/2015	544-800	Martin	135	25.6	23.4	4.05	19.2	1.04	2.31	23.8	15.6	247
Number of Detections				25	25	25	25	25	24	22	25	25	25
Minimum				108	9.53	15.1	0.955	3.80	0.411	1.26	18.6	10.4	210
Average				171	41.5	26.6	3.02	13.7	1.61	1.94	30.9	19.8	280
Standard Deviation				25	12.3	13.5	0.92	4.10	0.85	0.38	13.7	10.9	46.0
Maximum				213	63.1	76.4	4.38	21.0	3.88	2.91	66.8	59.7	418

Notes: CaCO₃ = calcium carbonate; ft bls = feet below land surface; mg/l = milligrams per liter; Dup = field duplicate sample; NS = no standard; values in **BOLD** exceed the EPA Maximum Contaminant Levels

Non-detect results indicate a Reporting Limit except in the case of wells NSH-004B, NSH-005, and NSH-006 (12/12/2012), which indicate a Practical Quantitation Limit.

^a Wells were completed in the sulfide zone and are not expected to be representative of the water quality in the oxide zone. Therefore, the data from these wells were not included in the statistical analyses.

^b Many of the wells have open boreholes or are screened across more than one interval, but do not have packers installed. Therefore, an effective screen interval is defined as the portion of the borehole either open or adjacent to a

^c The well has three separate screened intervals between 1060 and 1582 ft bls. No packers were installed during sampling so the formations accessed during pumping are assumed to include all three intervals.

^d The TDS value reported is expected to be erroneous due to the difficulty in filtering the sample. The laboratory flagged the result as an estimate. The calculated TDS was 697 mg/l; the ratio of the TDS to the calculated TDS was greater than 3.3.

TABLE I-2
Dissolved Metals in Groundwater

Well ID	Sample Date	Effective Screen Interval ^b	Geologic Unit	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Lead	Mercury	Nickel	Selenium	Thallium	Uranium
		(ft bls)		(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Arizona Aquifer Water Quality Standard				0.006	0.05	2	0.004	0.005	0.1	0.05	0.002	0.1	0.05	0.002	NS
EPA National Primary Drinking Water Regulations Maximum Contaminant Level				0.006	0.01	2	0.004	0.005	0.1	0.015	0.002	NS	0.05	0.002	0.030
NSH-004B	12/04/2012	705-1009	Martin/Upper Abrigo?	<0.2	<0.04	0.053	<0.002	<0.002	<0.03	<0.04	<0.001	<0.05	<0.04	<0.05	NM
NSH-005	11/19/2012	0-1040	Martin/Upper Abrigo?	<0.2	<0.04	0.084	<0.002	<0.002	<0.03	<0.04	<0.001	<0.05	<0.04	<0.05	NM
NSH-006	12/12/2012	640-680	Alluvium	<0.2	<0.04	0.082	<0.002	<0.002	<0.03	<0.04	<0.001	<0.05	<0.04	<0.05	NM
NSH-006	05/13/2015			<0.00300	<0.00300	0.103	0.00034	<0.00020	0.006	<0.003	<0.00020	0.0014	<0.0030	<0.00100	0.00363
NSH-007	02/26/2015	484-620	Abrigo	<0.00300	<0.0030	0.0364	0.00021	<0.00020	<0.0015	<0.0030	<0.00020	<0.0010	<0.0030	<0.00100	0.00490
NSH-007 Dup	02/26/2015			<0.00300	<0.00300	0.0374	0.0002	<0.00020	<0.0015	<0.0030	<0.00020	<0.0010	<0.0030	<0.00100	0.00505
NSH-008	01/18/2015	711-840	Middle/Lower Abrigo	<0.0025	0.0017	0.0396	<0.0005	<0.0005	<0.004	<0.0005	<0.0002	<0.004	0.0014	<0.0005	0.00340
NSH-009	03/12/2015	813-995	Middle Abrigo	<0.00300	<0.0030	0.00202	0.00047	<0.00020	0.004	<0.0030	<0.00020	0.0016	<0.0030	<0.00100	0.00523
NSH-010	04/21/2015	546-720	Escabrosa, Martin	<0.0030	<0.00300	0.015	0.00063	0.00044	<0.0015	<0.0030	<0.00020	<0.001	<0.0030	<0.00100	0.01800
NSH-011	04/30/2015	500-540	Alluvium	<0.0030	<0.0030	0.0436	<0.00020	<0.00020	0.0033	<0.0030	<0.00020	0.0048	<0.0030	<0.00100	0.00127
NSH-013	05/04/2015	650-1070	Martin (Escabrosa, Texas Canyon)	<0.00300	<0.00300	0.018	<0.00020	<0.00020	0.0041	<0.0030	<0.00020	0.0011	0.0031	<0.00100	0.00556
NSH-014B ^a	04/23/2015	1180-1260	Lower Abrigo Sulfide	<0.0030	0.00606	0.274	0.0106	0.00054	0.0131	0.0467	<0.0002	0.0353	<0.0030	<0.00100	0.01810
NSH-015	03/26/2015	585-820	Texas Canyon Quartz Monzonite	<0.0030	<0.00300	0.37	0.00021	<0.00020	0.0049	<0.0030	<0.00020	0.0021	<0.0030	<0.00100	0.00349
NSH-016	05/14/2015	580-820	Texas Canyon Quartz Monzonite	<0.00300	<0.00300	0.337	<0.00020	<0.00020	0.0073	<0.0030	<0.00020	0.0078	<0.0030	<0.00100	0.00421
NSH-017	04/09/2015	940-1181	Middle/Lower Abrigo	<0.00300	<0.00300	0.131	0.00022	<0.00020	0.0043	<0.0030	<0.00020	0.0016	<0.0030	<0.00100	0.01970
NSH-018	04/16/2015	610-992	Black Prince	<0.00300	<0.0030	0.071	<0.00020	<0.00020	0.0041	<0.00300	<0.00020	0.0013	<0.0030	<0.00100	0.00140
NSH-019	03/16/2015	638-1300	Martin/Abrigo	<0.00300	<0.00300	0.0237	<0.00020	<0.00020	0.0057	<0.003	<0.00020	0.0015	<0.0030	<0.00100	0.02330
NSH-020	03/25/2015	1060-1582 ^c	Black Prince/Escabrosa/Martin	<0.0030	<0.0030	0.0681	<0.00020	<0.00020	0.0041	<0.0030	<0.00020	0.002	<0.0030	<0.00100	0.00178
NSH-021C	05/19/2015	624-1372	Martin/Abrigo	<0.0030	<0.00300	0.0341	<0.00020	<0.00020	0.0056	<0.0030	<0.00020	0.0017	<0.0030	<0.00100	0.02280
NSH-022	04/02/2015	1110-1131	Abrigo	<0.00300	<0.00300	0.0614	<0.00020	0.00062	<0.0015	<0.003	<0.0002	<0.001	<0.003	<0.001	0.00113
NSH-023	03/03/2015	645-1442	Martin/Abrigo	<0.003	<0.003	0.0113	<0.0002	0.0003	<0.0015	<0.003	<0.0002	<0.001	<0.003	<0.001	0.00256
NSH-024	05/27/2015	625-1440	Martin/Abrigo	<0.003	<0.003	0.0339	<0.0002	<0.0002	0.0054	<0.003	<0.0002	0.0011	<0.003	<0.001	0.00905
NSH-025 ^a	05/05/2015	1469-1551	Lower Abrigo Sulfide	<0.003	<0.003	0.0363	<0.0002	<0.0002	0.005	<0.003	<0.0002	<0.001	<0.003	<0.001	0.00111
NSH-026	04/20/2015	626-900	Escabrosa/Upper Abrigo	<0.003	<0.003	0.0687	0.00031	<0.0002	0.0052	<0.003	<0.0002	0.0013	<0.003	<0.001	0.00137
NSH-026 Dup	04/20/2015			<0.003	<0.003	0.0723	0.00032	<0.0002	0.0046	<0.003	<0.0002	0.0011	<0.003	<0.001	0.00149
NSH-027	02/12/2015	850-1022	Upper Abrigo	<0.0005	0.0016	0.019	<0.0005	<0.0005	<0.004	<0.0005	<0.0002	<0.004	0.0017	0.00073	0.01070
NSH-028	05/07/2015	544-800	Martin	<0.003	<0.003	0.0196	<0.0002	<0.0002	0.0039	<0.003	<0.0002	<0.001	<0.003	<0.001	0.00246
Number of Detections				0	2	23	7	3	14	0	0	13	3	1	20
Minimum				NA	0.0016	0.00202	0.0002	0.0003	0.0033	NA	NA	0.0011	0.0014	0.00073	0.00113
Average				NA	0.00165	0.07340	0.00032	0.00045	0.00483	NA	NA	0.00217	0.00207	NA	0.00693
Standard Deviation				NA	0.00007	0.08991	0.00014	0.00016	0.00104	NA	NA	0.00187	0.00091	NA	0.00724
Maximum				NA	0.0017	0.37	0.00063	0.00062	0.0073	NA	NA	0.0078	0.0031	0.00073	0.0233

Notes: ft bls = feet below land surface; mg/l = milligrams per liter; NS = no standard; NM = not measured; NA = not applicable; Dup = field duplicate sample; values in **BOLD** exceed the Arizona Aquifer Water Quality Standard or the EPA Maximum Contaminant Level

Water quality data is for dissolved metals with the exception of samples NSH-004B, NSH-005, and NSH-006 which are total metals.

Non-detect results indicate a Reporting Limit except in the case of wells NSH-004B, NSH-005, and NSH-006 (12/12/2012), which indicate a Practical Quantitation Limit.

^a Wells were completed in the sulfide zone and are not expected to be representative of the water quality in the oxide zone. Therefore, the data from these wells were not included in the statistical analyses.

^b Many of the wells have open boreholes or are screened across more than one interval, but do not have packers installed. Therefore, an effective screen interval is defined as the portion of the borehole either open or adjacent to a filter pack.

^c The well has three separate screened intervals between 1060 and 1582 ft bls. No packers were installed during sampling so the formations accessed during pumping are assumed to include all three intervals.

TABLE I-3
Radiological Constituents in Groundwater

Well ID	Sample Date	Effective Screen Interval ^b	Geologic Unit	Gross Alpha Analytes	Adjusted Gross Alpha	Gross Beta Analytes	Radium-226	Radium-228	Uranium-234	Uranium-235	Uranium-238
		(ft bls)		(pCi/l)	(pCi/l)	(pCi/l)	(pCi/l)	(pCi/l)	(pCi/l)	(pCi/l)	(pCi/l)
Aquifer Water Quality Standard				NS	15	4 mrem/yr	5		NS	NS	NS
EPA National Primary Drinking Water Regulations Maximum Contaminant Level				NS	15	4 mrem/yr	5		30 µg/L		
NSH-006	05/13/2015	640-680	Alluvium	2.6 ± 1.2	-0.22	3.3 ± 1.4	0.43 ± 0.2	ND	1.51 ± 0.34	ND	1.26 ± 0.29
NSH-007	02/26/2015	484-620	Abrigo	3.3 ± 1.6	-0.44	4.3 ± 2	0.20 ± 0.14	ND	2.15 ± 0.49	0.111 ± 0.085	1.48 ± 0.37
NSH-007 Dup	02/26/2015			3.9 ± 1.6	-0.16	4.2 ± 1.8	0.13 ± 0.11	ND	2.47 ± 0.65	ND	1.59 ± 0.47
NSH-009	03/12/2015	813-995	Middle Abrigo	4.7 ± 1.2	-1.5	3.1 ± 1.1	ND	ND	3.88 ± 0.76	0.18 ± 0.1	2.17 ± 0.47
NSH-010	04/21/2015	546-720	Escabrosa, Martin	11.3 ± 2.2	-2.9	12.0 ± 2.3	ND	ND	7.3 ± 1.3	0.26 ± 0.12	6.6 ± 1.2
NSH-011	04/30/2015	500-540	Alluvium	12.8 ± 2.8	9.8	17.6 ± 3.6	0.23 ± 0.13	ND	1.95 ± 0.36	ND	0.97 ± 0.2
NSH-013	05/04/2015	650-1070	Martin (Escabrosa, Texas Canyon)	2.6 ± 1.4	-2.6	6.4 ± 2	0.23 ± 0.15	ND	2.77 ± 0.57	0.162 ± 0.094	2.26 ± 0.48
NSH-014B ^a	04/23/2015	1180-1260	Lower Abrigo Sulfide	275 ± 49	255	169 ± 31	5.0 ± 1.3	6.6 ± 1.6	10.5 ± 1.9	0.53 ± 0.2	9.2 ± 1.7
NSH-015	03/26/2015	585-820	Texas Canyon Quartz Monzonite	4.0 ± 1.2	-0.81	6.6 ± 1.7	0.87 ± 0.31	0.87 ± 0.32	3.38 ± 0.68	ND	1.41 ± 0.34
NSH-016	05/14/2015	580-820	Texas Canyon Quartz Monzonite	7.1 ± 2.1	1.8	16.0 ± 3.5	0.64 ± 0.25	0.60 ± 0.27	3.88 ± 0.73	0.093 ± 0.067	1.36 ± 0.32
NSH-017	04/09/2015	940-1181	Middle/Lower Abrigo	12.9 ± 2.8	-2.1	8.2 ± 2.2	0.79 ± 0.29	ND	7.5 ± 1.4	0.36 ± 0.15	7.1 ± 1.3
NSH-018	04/16/2015	610-992	Black Prince	ND	-0.28	3.9 ± 1.8	0.19 ± 0.12	ND	0.81 ± 0.22	0.056 ± 0.051	0.51 ± 0.17
NSH-019	03/16/2015	638-1300	Martin/Abrigo	14.5 ± 2.6	-2.0	13.4 ± 2.4	1.61 ± 0.6	0.61 ± 0.33	7.7 ± 1.5	0.42 ± 0.22	8.4 ± 1.6
NSH-020	03/25/2015	1060-1582 ^c	Black Prince/Escabrosa/Martin	3.4 ± 1.5	1.5	ND	0.109 ± 0.082	ND	1.20 ± 0.26	0.078 ± 0.05	0.66 ± 0.16
NSH-021C	05/19/2015	624-1372	Martin/Abrigo	14.6 ± 2.5	-3.6	19.7 ± 3.3	2.30 ± 0.67	ND	9.1 ± 1.6	0.26 ± 0.13	8.8 ± 1.6
NSH-022	04/02/2015	1110-1131	Abrigo	3.41 ± 0.93	-0.44	2.9 ± 1.1	0.40 ± 0.2	ND	2.41 ± 0.51	0.099 ± 0.072	1.34 ± 0.33
NSH-023	03/03/2015	645-1442	Martin/Abrigo	3.5 ± 1.5	-0.25	5.1 ± 2.2	1.20 ± 0.39	ND	1.93 ± 0.42	ND	1.74 ± 0.39
NSH-024	05/27/2015	625-1440	Martin/Abrigo	11.9 ± 3.1	4.8	19.7 ± 4	3.32 ± 0.92	0.74 ± 0.32	3.56 ± 0.68	0.154 ± 0.086	3.34 ± 0.65
NSH-025 ^a	05/05/2015	1469-1551	Lower Abrigo Sulfide	12.1 ± 2.9	-2.3	67 ± 11	0.72 ± 0.29	0.78 ± 0.38	8.7 ± 1.5	0.26 ± 0.12	5.4 ± 1
NSH-026	04/20/2015	626-900	Escabrosa/Upper Abrigo	2.5 ± 1.4	1.3	12.9 ± 3.1	1.10 ± 0.37	ND	0.64 ± 0.19	ND	0.51 ± 0.17
NSH-026 Dup	04/20/2015			3.3 ± 1.5	1.8	40.8 ± 7.1	1.39 ± 0.45	ND	0.86 ± 0.25	ND	0.64 ± 0.21
NSH-028	05/07/2015	544-800	Martin	5.3 ± 1.9	3.4	21.8 ± 4.1	1.51 ± 0.46	ND	0.93 ± 0.25	ND	0.89 ± 0.24
Number of Detections				17	17	17	16	3	18	12	18
Minimum				1.1	-3.6	1.4	0.06	-0.06	0.64	0.017	0.51
Average				6.8	0.3	9.9	0.9	0.3	3.5	0.1	2.8
Standard Deviation				4.8	3.2	6.8	0.9	0.3	2.7	0.1	2.8
Maximum				14.6	9.8	21.8	3.32	0.87	9.1	0.42	8.8

Notes: ft bls = feet below land surface; pCi/l = picoCuries per liter; NS = no standard; mrem/yr = millirems per year; ND = non-detect; Dup = field duplicate sample; values in **BOLD** exceed the Arizona Aquifer Water Quality Standard

^a Wells were completed in the sulfide zone and are not expected to be representative of the water quality in the oxide zone. Therefore, the data from these wells were not included in the statistical analyses.

^b Many of the wells have open boreholes or are screened across more than one interval, but do not have packers installed. Therefore, an effective screen interval is defined as the portion of the borehole either open or adjacent to a filter pack.

^c The well has three separate screened intervals between 1060 and 1582 ft bls. No packers were installed during sampling so the formations accessed during pumping are assumed to include all three intervals.

TABLE I-4
Detected Volatile Organic Compounds and Polycyclic Aromatic Hydrocarbons in Groundwater

				Volatile Organic Compounds										Polycyclic Aromatic Hydrocarbons											
Well ID	Sample Date	Effective Screen Interval ^b	Geologic Unit	Acetone	1,2-Dichloroethane	Benzene	Toluene	Ethylbenzene	Xylene (Total)	n-propylbenzene	tert-Butyl Alcohol	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Anthracene	Acenaphthene	Acenaphthylene	Benzo(g,h,i)perylene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	1-Methylnaphthalene	2-Methylnaphthalene
		(ft bls)		(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)
Arizona Aquifer Water Quality Standard				NS	5	5	1,000	700	10,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
EPA National Primary Drinking Water Regulations Maximum Contaminant Level				NS	5	5	1,000	700	10,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.2	NS	NS	NS	NS	NS	NS
CS-10	02/11/2015	0-1656	Basin Fill/Martin/Abrigo/ Bolsa	<2500	<500	310	680	110	500	<50	<250	110	<50	4.8	6.6	1.7	0.052	0.067	0.15	16	330	34	0.96	330	460
CS-14	02/11/2015	0-1375	Basin Fill/Escabrosa/ Martin/Abrigo/ Bolsa	<250	<50	7.3	44	30	90	7.1	<25	60	12	12	13	3.5	<0.050	0.21	<0.050	27	510	86	1.6	690	1,000
NSH-006	05/13/2015	640-680	Alluvium	<2.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-007	02/26/2015	484-620	Abrigo	<2.5	<0.5	<0.5	0.59	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-007 Dup	02/26/2015			<2.5	<0.5	<0.5	0.58	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-007	05/06/2015			<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5	<0.5	NM	NM	NM	NM	NM	NM	NM	<0.5	NM	NM	NM	NM
NSH-008	01/18/2015	711-840	Middle/Lower Abrigo	NM	<0.13	<0.13	<0.19	<0.19	<0.27	<0.17	NM	<0.15	<0.16	<0.48	<0.48	<0.48	<0.095	<0.095	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48
NSH-009	03/12/2015	813-995	Middle Abrigo	<2.5	<0.5	<0.5	3.93	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-010	04/21/2015	546-720	Escabrosa, Martin	<2.5	<0.5	<0.5	44.9	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-011	04/30/2015	500-540	Alluvium	2,250	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	NM	<2.5	<2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-013	05/04/2015	650-1070	Martin (Escabrosa, Texas Canyon)	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-014B ^a	04/23/2015	1180-1260	Lower Abrigo Sulfide	<12.5	<2.5	<2.5	782	<2.5	<2.5	<2.5	NM	<2.5	<2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-015	03/26/2015	585-820	Texas Canyon Quartz Monzonite	<2.5	0.96	4.56	0.74	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.268	<0.01	<0.01	NM	0.0262
NSH-016	05/14/2015	580-820	Texas Canyon Quartz Monzonite	<2.5	1.3	0.34	8.83	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-017	04/09/2015	940-1181	Middle/Lower Abrigo	<2.5	0.41	2.84	0.46	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0836	<0.01	<0.01	NM	<0.01
NSH-018	04/16/2015	610-992	Black Prince	<2.5	<0.5	<0.5	0.51	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-019	03/16/2015	638-1300	Martin/Abrigo	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-020	03/25/2015	1060-1582 ^c	Black Prince/Escabrosa/Martin	<2.5	<0.5	<0.5	1.76	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-021C	05/19/2015	624-1372	Martin/Abrigo	<2.5	<0.5	<0.5	3.51	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-022	04/02/2015	1110-1131	Abrigo	187	<10	<10	1940	<10	<10	<10	NM	<10	<10	<0.01	<0.01	<0.01	0.0061	<0.01	<0.01	0.0078	<0.01	0.0066	<0.01	NM	0.0078
NSH-022	05/04/2015			<50	<0.5	<0.5	1130	<0.5	<0.5	<1	NM	<1	<1	NM	NM	NM	NM	NM	NM	<5	NM	NM	NM	NM	
NSH-023	03/03/2015	645-1442	Martin/Abrigo	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-024	05/27/2015	625-1440	Martin/Abrigo	<2.5	<0.5	<0.5	7.36	<0.5	<0.5	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-025 ^a	05/05/2015	1469-1551	Lower Abrigo Sulfide	<50	<10	<10	379	<10	<10	<10	NM	<10	<10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-026	04/20/2015	626-900	Escabrosa/Upper Abrigo	<2.5	<0.5	<0.5	0.52	<0.5	<1.0 ^d	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSH-026 Dup	04/20/2015			<2.5	<0.5	<0.5	0.51	<0.5	<1.0 ^d	<0.5	NM	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM
NSH-027	02/12/2015	850-1022	Upper Abrigo	NM	<0.13	<0.13	<0.19	<0.19	<0.27	<0.17	NM	<0.15	<0.16	<0.47	<0.47	<0.47	<0.094	<0.094	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47
NSH-028	05/07/2015	544-800	Martin	<50	<10	<10	339	<10	<10	<10	NM	<10	<10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NM	<0.01
NSM-003	02/11/2015	608-1028	Texas Canyon Quartz Monzonite/ Middle and Lower Abrigo	<50	<10	<1	<5	<1	<3	<1	29	<1	<1	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.25	<0.050	<0.050	<0.25	<0.25

Notes: ft bls = feet below land surface; µg/l = micrograms per liter; NS = no standard; NM = not measured; Dup = field duplicate sample; values in **BOLD** are detections above the reporting limit and values in **BOLD** exceed the Arizona aquifer water quality standard.

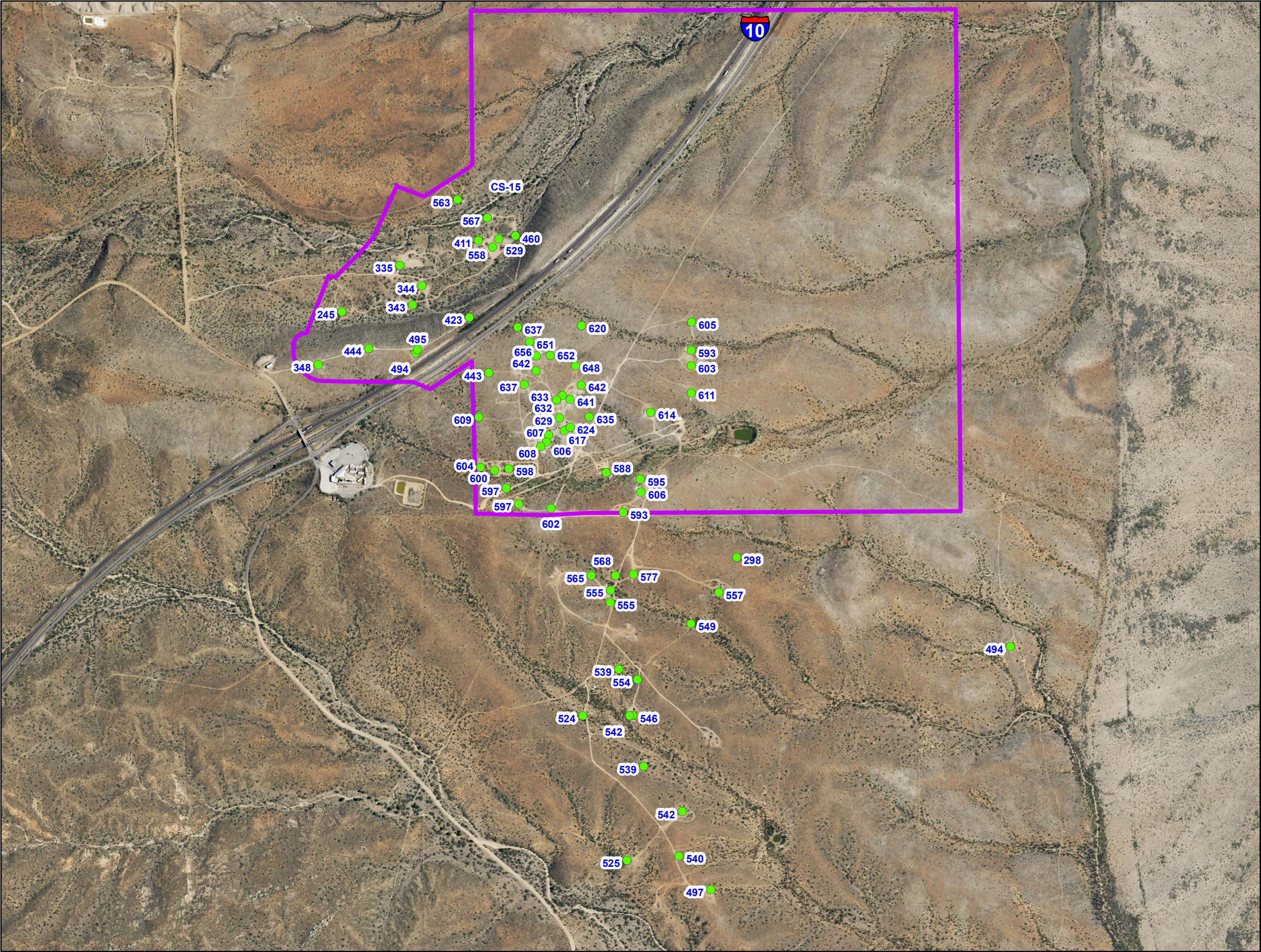
Non-detect results indicate a Practical Quantitation Limit except in the case of wells CS-10, CS-14, NSM-003, which indicate a Method Detection Limit.

^a Wells were completed in the sulfide zone and are not expected to be representative of the water quality in the oxide zone. Therefore, the data from these wells were not included in the statistical analyses.


^b Many of the wells have open boreholes or are screened across more than one interval, but do not have packers installed. Therefore, an effective screen interval is defined as the portion of the borehole either open or adjacent to a filter pack.


^c The well has three separate screened intervals between 1060 and 1582 ft bls. No packers were installed during sampling so the formations accessed during pumping are assumed to include all three intervals.

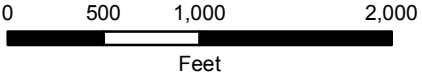
^d Sum of m-,o-, and p-xylenes; all non-detect at the 0.5 µg/l level.



Legend

 Gunnison Copper Project

 Well showing depth to groundwater (feet below land surface)

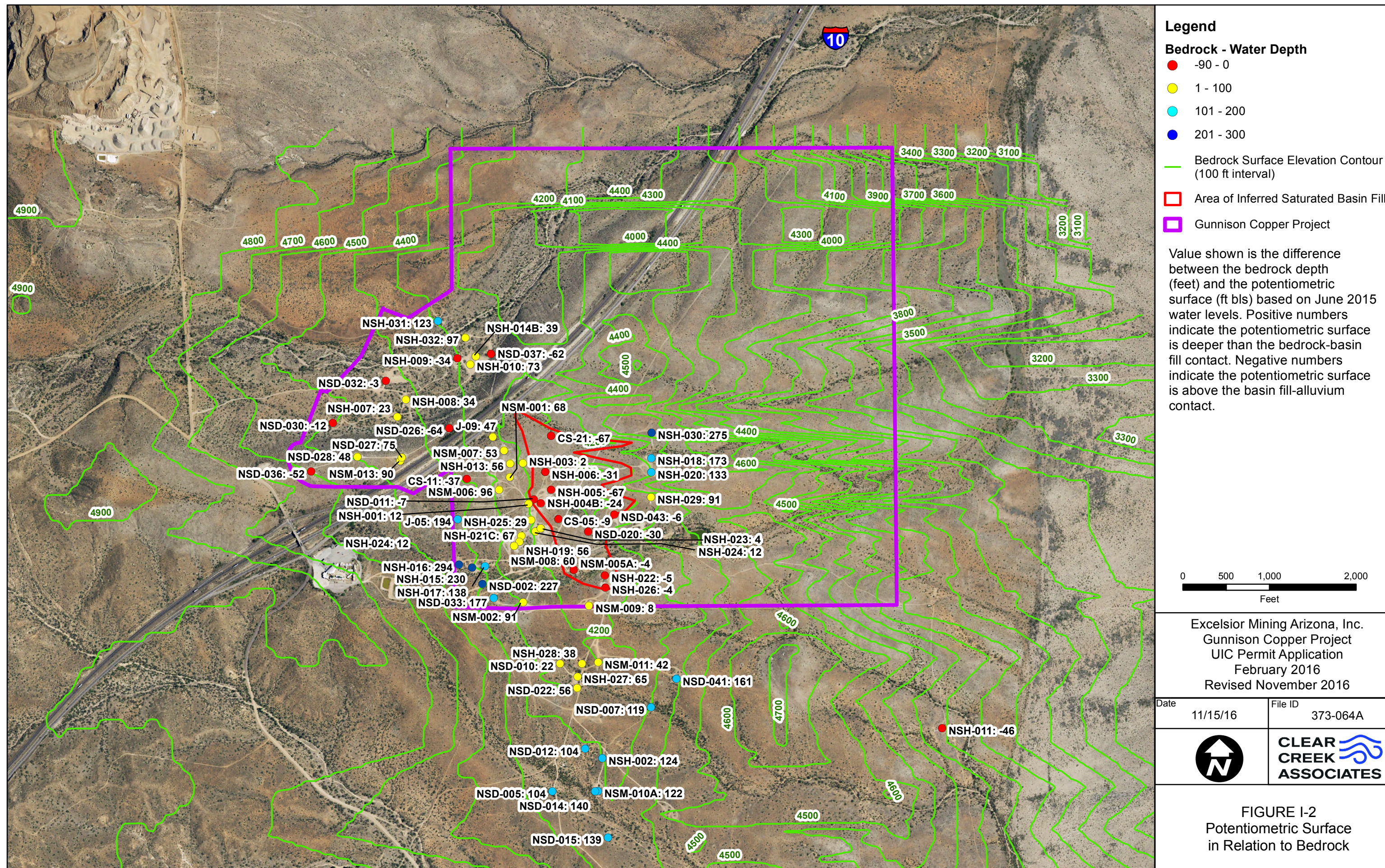


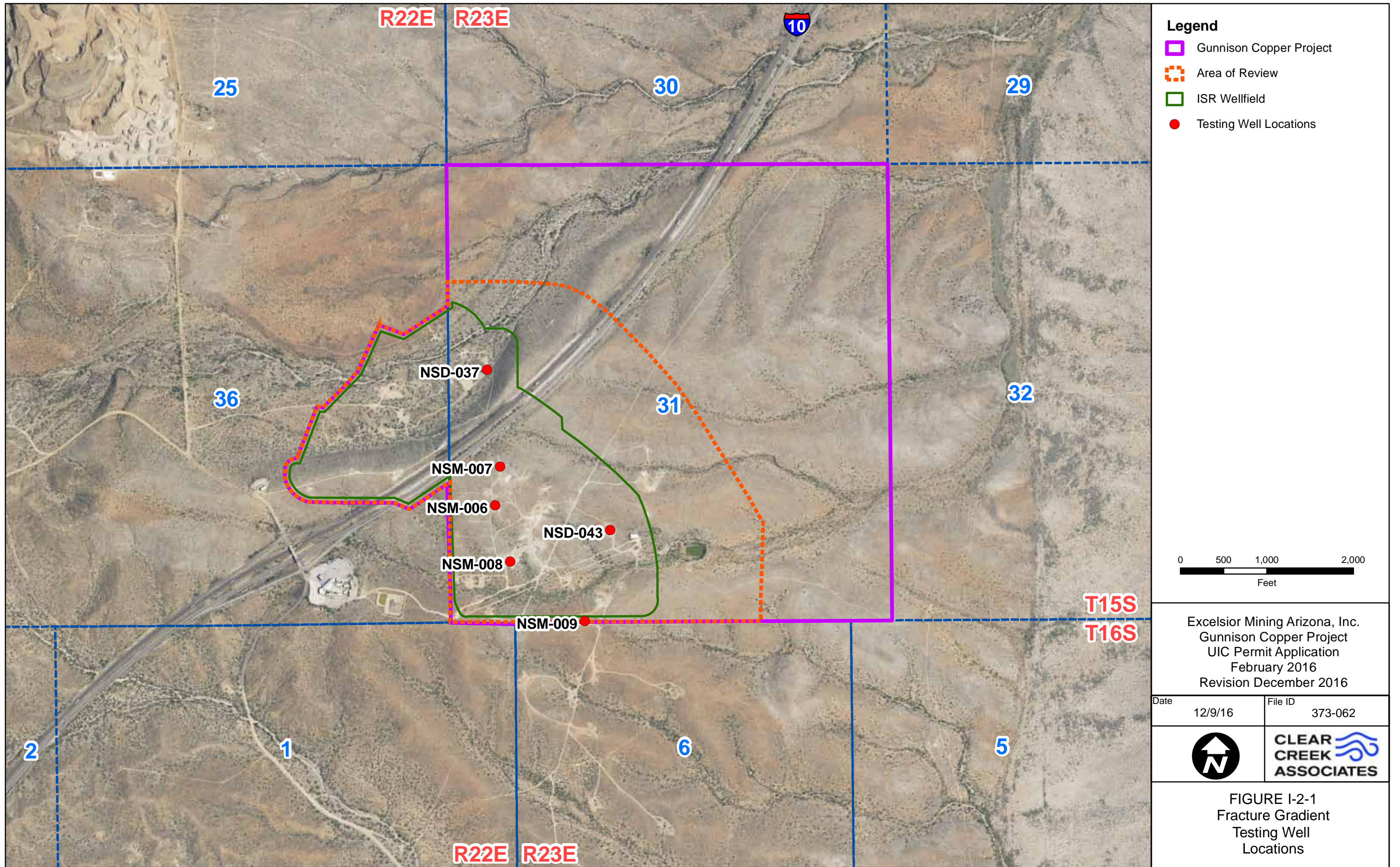
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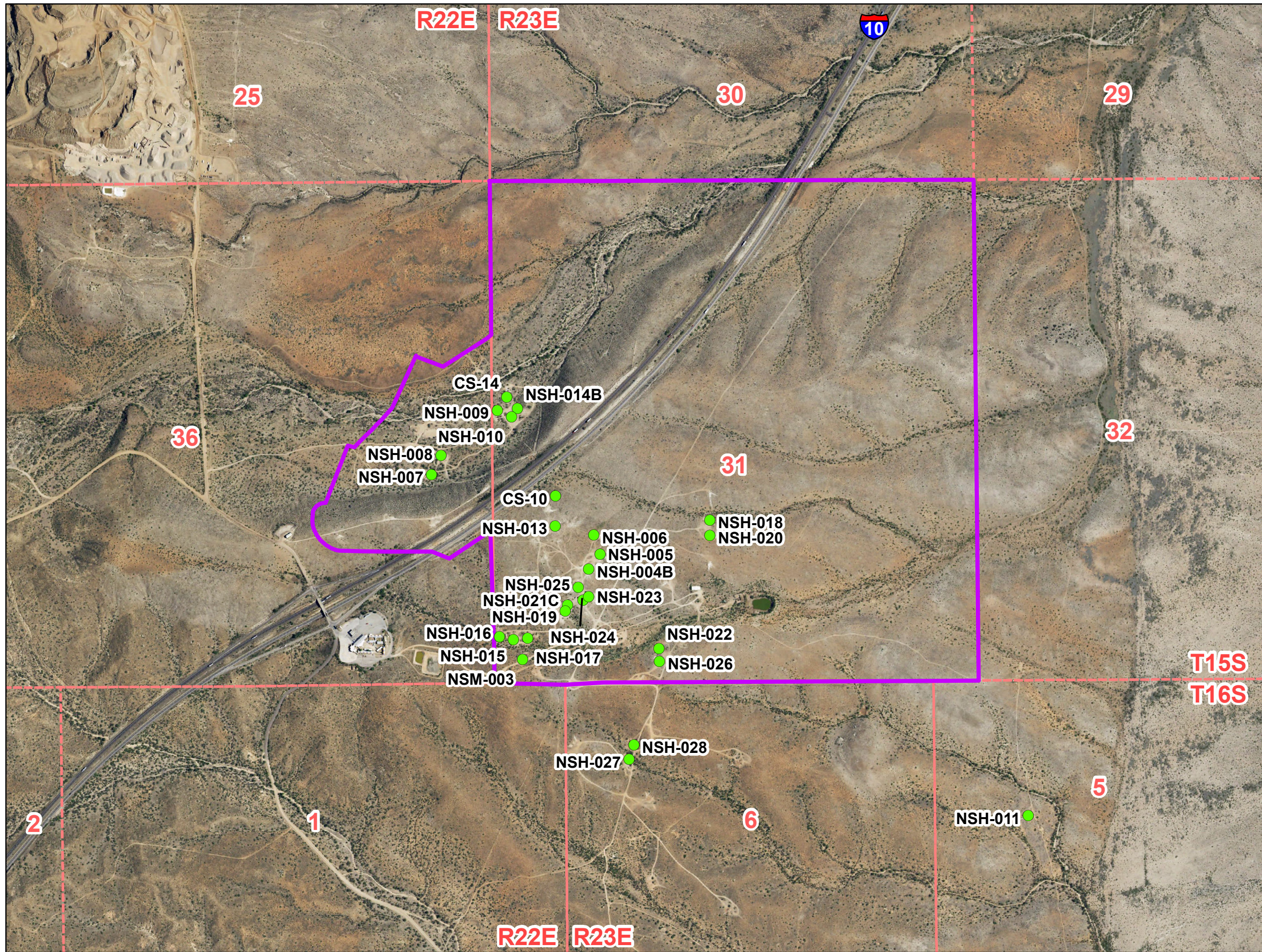
Date	1/26/16	File ID	373-026A
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FIGURE I-1
Depths to Groundwater,
June 2015

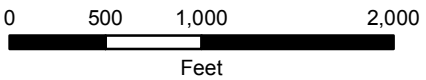






Legend

- Gunnison Copper Project
- Well with Water Quality Data

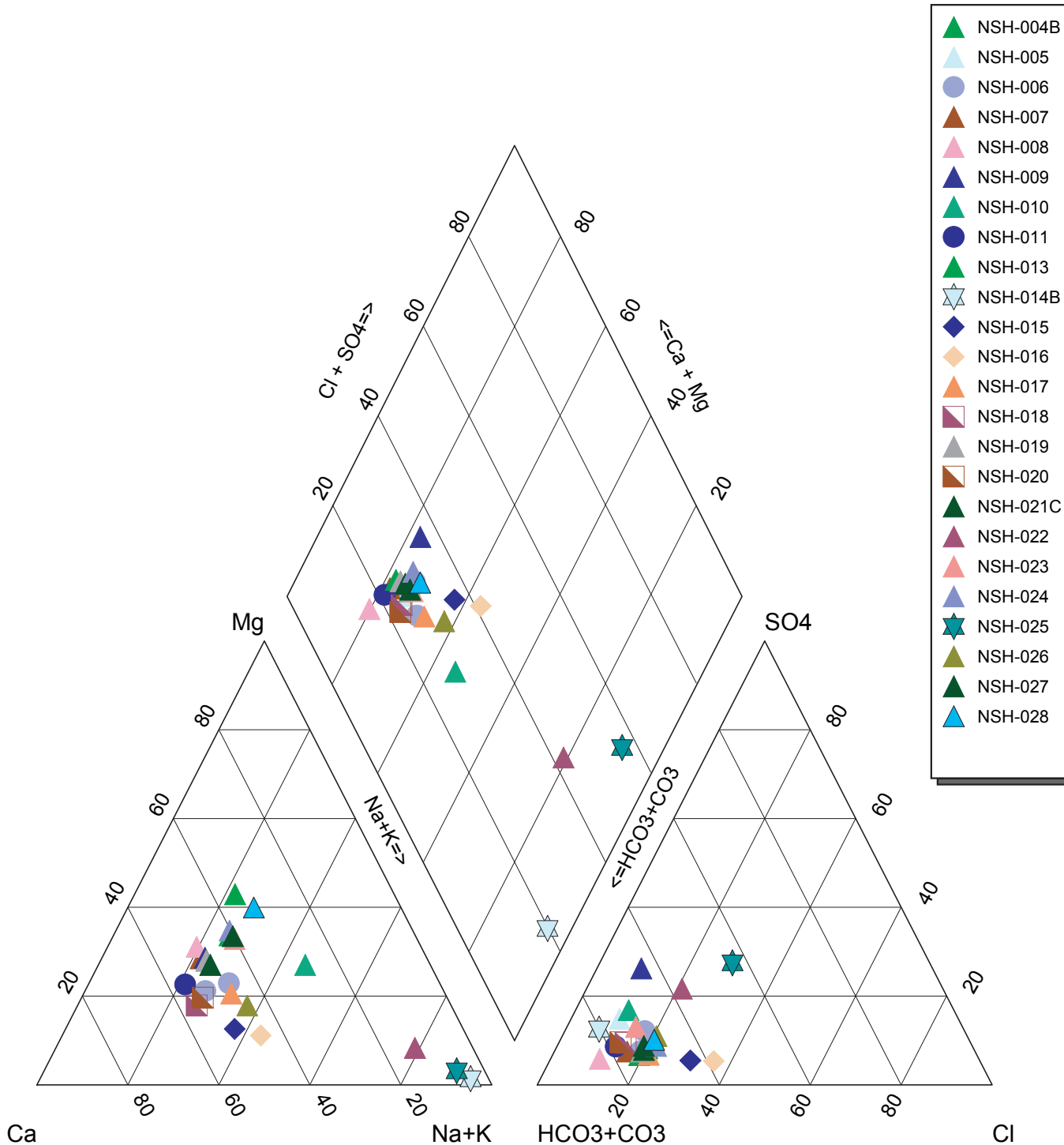


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FIGURE I-3
Well Locations for
Groundwater Quality Samples



Symbol Groups:

Triangles – Within the proposed ISR mine

Diamonds - Texas Canyon quartz monzonite overlying the oxide

Circles – Basin fill

Squares – Bedrock (oxide zone) east of proposed ISR mine

Stars – Sulfide zone underlying the proposed ISR mine

NOTE: CS-10, CS-14, and NSM-003 were not plotted on the Piper diagram as major cations and anions were not analyzed

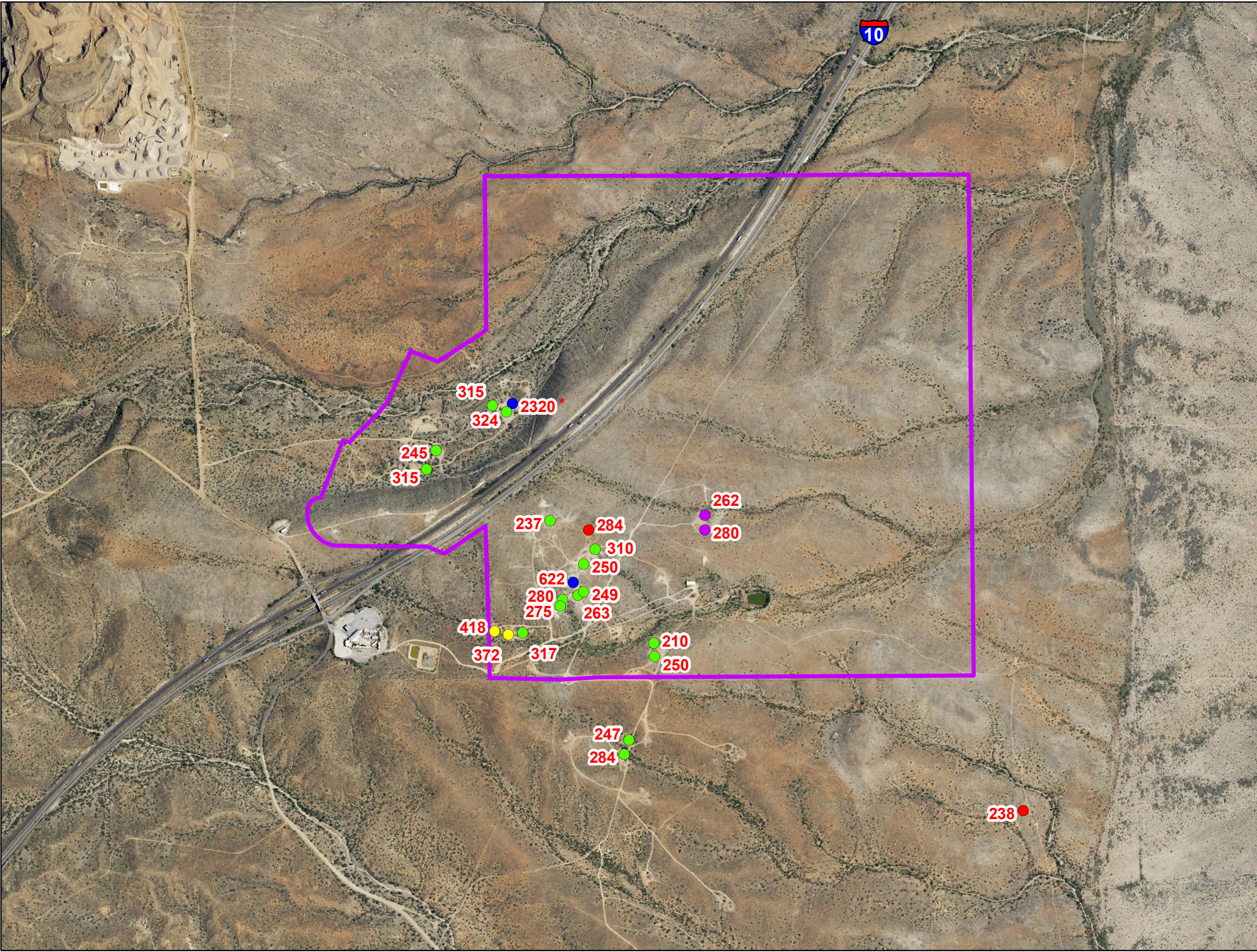
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CLEAR CREEK ASSOCIATES

File ID
A373-017A

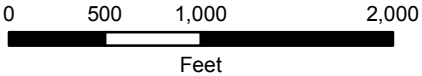
Date
1/26/16

FIGURE I-4
Piper Diagram for
NSH Wells



- Legend**
- Gunnison Copper Project
 - Well Completed in Oxide Zone within Future Wellfield
 - Well Completed in Oxide Zone East of Wellfield
 - Well Completed in Sulfide Zone
 - Well Completed in Alluvium
 - Well Completed in Quartz Monzonite

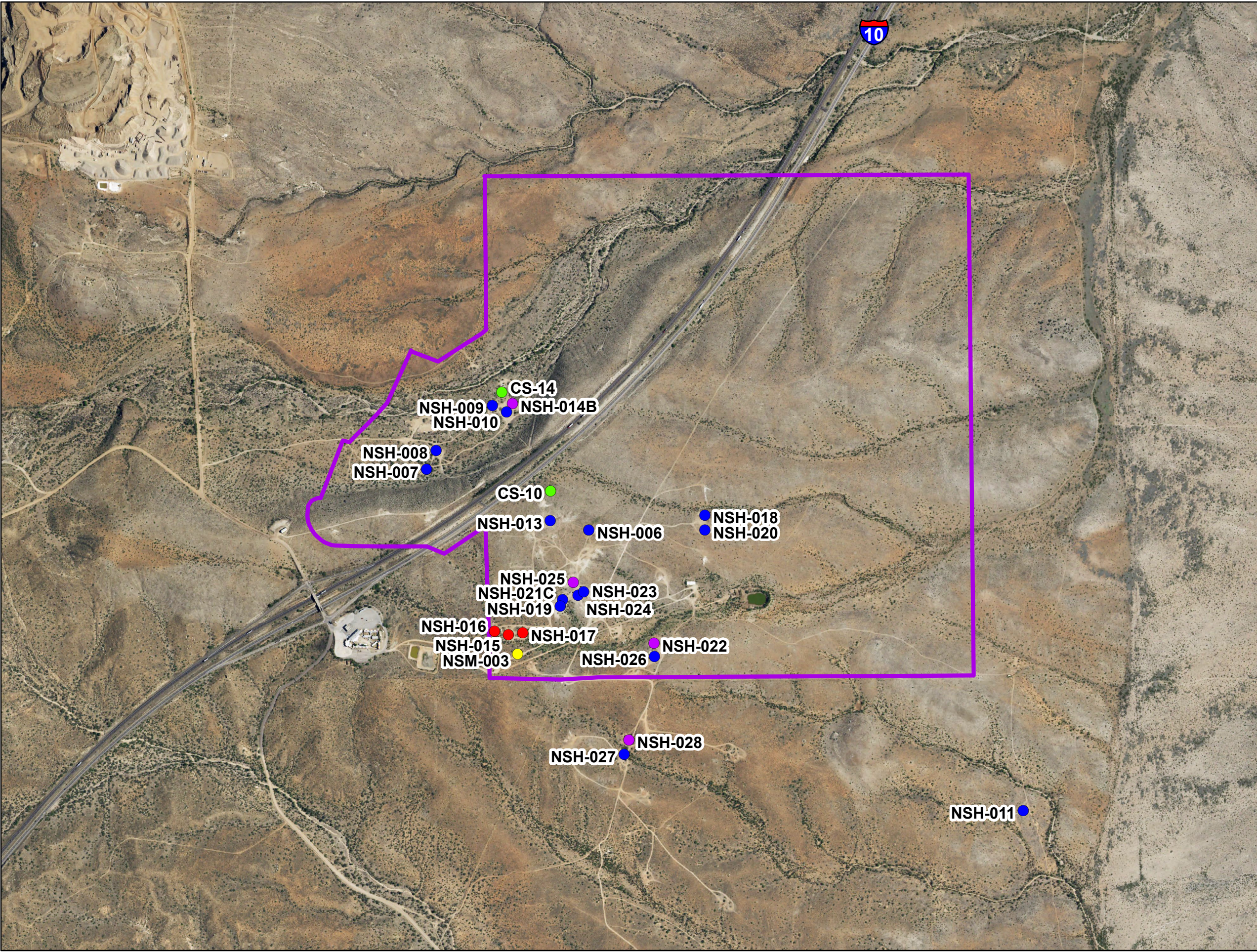
Notes:
*Value is inferred as erroneous. See Table I-1 for details.
Concentrations in mg/L



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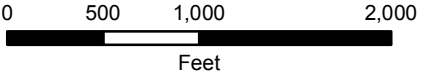
FIGURE I-5
TDS Concentrations



Legend

- Gunnison Copper Project
- Corehole Containing Free Product
- Well with Detections of 1,2 DCA & Benzene
- Well with Elevated Toluene*
- Corehole with Detections of Tert-Butyl Alcohol
- Well with No Measured Elevated Petroleum Hydrocarbons

* Elevated = detected at or above 1/3 of the AWQS

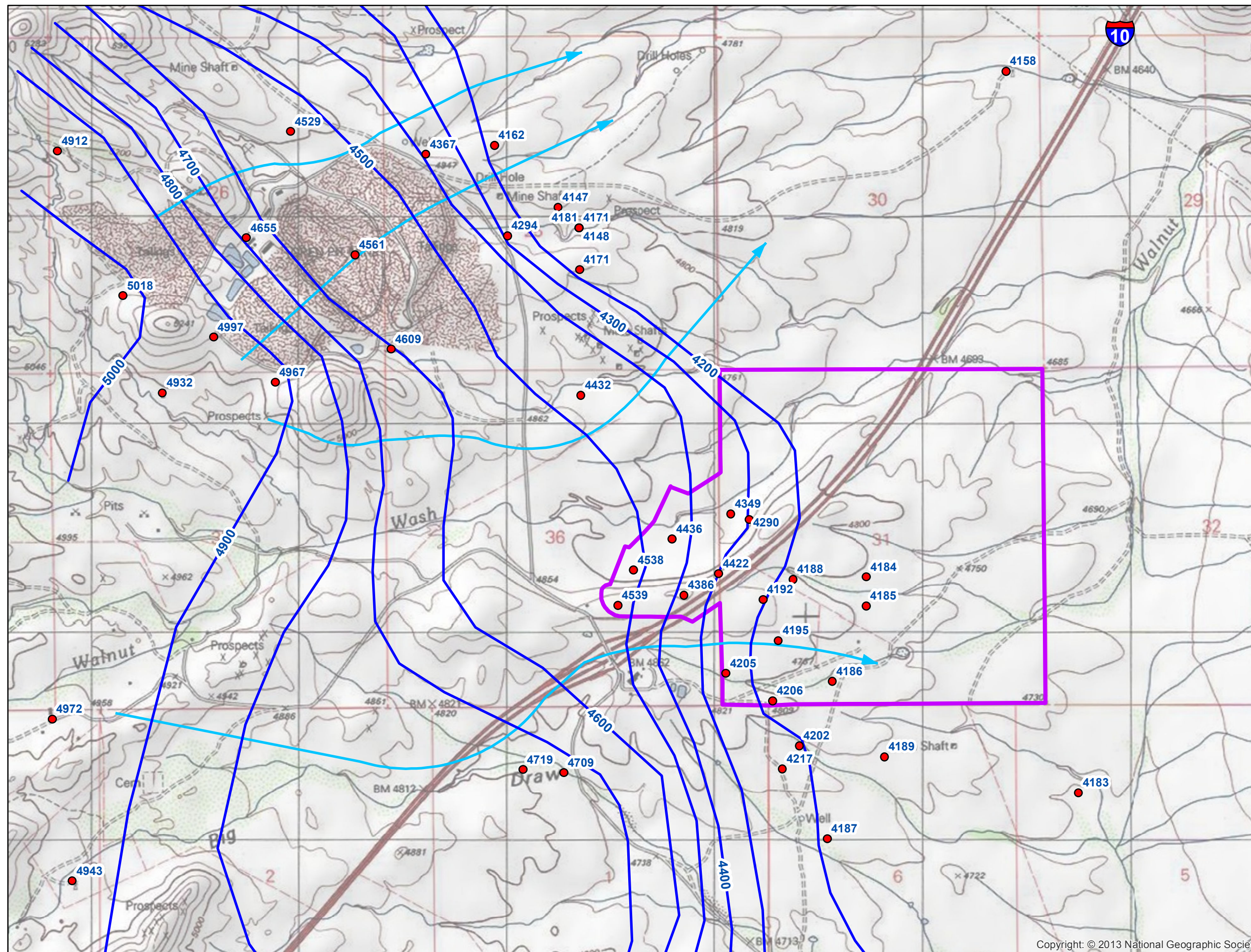


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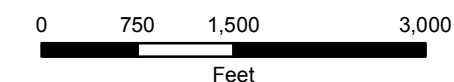
FIGURE I-6
Petroleum Hydrocarbon
Sampling Results



Legend

- Well - Groundwater Elevation (ft amsl)
- Groundwater Elevation (ft amsl)
100 ft contour interval
- ➔ Groundwater Flow Direction
- Gunnison Copper Project

Site water levels are from June 2015
All other water levels are the
most recent data from 1949 to
the present



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CREEK
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FIGURE I-7
Potentiometric Surface Map